भारतीय मानक
Indian Standard

IS 3110 : 2015
(Reaffirmed 2020)

चाँदी का वर्क — विशिष्टि

(दूसरा पुनरीक्षण)

Silver Leaf — Specification

(Second Revision)

ICS 67.220.20

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March 2015 **Price Group 2**

Food Additives Sectional Committee, FAD 08

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Food Additives Sectional Committee had been approved by the Food and Agriculture Division Council.

This standard was first published in 1965. Silver leaf is used extensively in India for edible purposes, such as in AYURVEDIC and UNANI systems of medicine and as a coating on sweets, PAN and other eatables. Since a very high purity of silver was recommended in order to avoid possibilities of contamination due to harmful elements as silver leaf is used for edible purpose, the maximum permissible impurity limits of harmful elements of arsenic, lead and cadmium was specified in the standard in its first revision in 1982.

As the use of silver coating on sweets, PAN and other eatables has only an aesthetic value and it does not add any nutritional value, the current revision of this standard is undertaken to reduce the thickness of the foil. Also various grade of foil has been specified in this standard. The maximum limits for arsenic, lead, cadmium and heavy metals have been aligned with FSSAI regulations for food additives. Also this revision specifies methods of test for these requirements.

In the formulation of this standard, due consideration has been given to the provisions of the *Food Safety and Standards Act*, 2006 and the Rules and Regulations framed thereunder and the *Legal Metrology (Packaged Commodities) Rules*, 2011. However, this standard is subject to the restrictions imposed under these, wherever applicable.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SILVER LEAF — SPECIFICATION

(Second Revision)

1 SCOPE

1.1 This standard covers the requirements of silver leaf used for edible purposes along with their methods of test.

2 REFERENCES

The following standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

IS No.	*Title*
2113 : 2002	Assaying silver in silver and silver alloys — Methods
4905 : 1968	Methods for random sampling

3 GRADES

Depending upon the grammage of the silver foil, it shall be of following five grades when tested in accordance with the method given at Annex A.

Grade	*Weight per square meter, gm (Grammage)*
I	Less than 1.9
II	From 1.9 to 2.0
III	More than 2.0 to 2.2
IV	More than 2.2 to 2.4
V	More than 2.4 to 2.8

4 REQUIREMENTS

4.1 Description

Silver leaf shall be in the form of sheet free from creases and folds. It shall be supplied in uniform shape and sizes as agreed to between the purchaser and the manufacturer.

4.2 Purity

The silver content of silver leaf when tested in accordance with IS 2113, shall be of minimum 999/1 000 fineness.

4.3 Toxic Substances

The toxic substances in the silver leaf shall not exceed the limit as given in Table 1 when tested in accordance to the methods given in col 4 of Table 1.

Table 1 Toxic Substance

(*Clause* 4.3)

Sl No. (1)	**Characteristic** (2)	**Requirement** (3)	**Method of Test, Ref to** (4)
i)	Lead (as Pb), ppm, *Max*	10	Annex B
ii)	Arsenic (as As), ppm, *Max*	3	Annex B
iii)	Cadmium (as Cd), ppm, *Max*	1	Annex B
iv)	Total heavy metals, ppm, *Max*	40	Annex C

5 PACKING

5.1 Silver leaf shall be supplied in either of the two forms as specified by the purchaser:

a) *Detachable* — In books with silver leaf loosely placed in between white tissue paper; or

b) *Non-detachable* — In books with silver leaf pressed on white tissue paper to prevent silver leaf becoming detached from paper due to draughts or air-currents.

5.2 Each book shall contain 10 silver leaves separated by good quality white tissue paper so as not to cause deterioration of surface quality of the silver leaves.

5.3 The books shall be properly packed in a suitable container so as to prevent damage due to creasing or bending in transit.

6 SAMPLING AND CRITERIA FOR CONFORMITY

6.1 Lot

In any consignment, minimum of ten packs shall constitute a lot.

6.2 The number of packs to be sampled from each lot for the purpose of workmanship, dimensional and weight requirements and also for assay shall be as given in Table 2. These packs shall be selected at random preferably with the help of random number tables (*see* IS 4905).

Table 2 Scale of Sampling

(*Clauses* 6.2, 6.3 *and* 6.4)

Number of Packs in a Lot (1)	Sample Size for Workmanship, Dimension and Weight Requirements (2)	Number of Determinations for Assay (3)
From 10 to 25	8	3
From 26 to 50	13	4
From 51 and above	20	5

6.3 All the packs selected as per col 2 of Table 2 shall be examined for workmanship, dimensional and weight requirements. There shall be no failure if the lot is to be accepted for these requirements.

6.4 The number of determinations to be carried out for assay shall be as given in col 3 of Table 2. For this purpose, at least 2 packs shall be as given in col 3 of Table 2. For this purpose, at least 2 packs shall be drawn for each determination and 5 leaves from each pack shall be taken out. A composite sample of 1 000 mg shall be prepared. This process is to be repeated for each determination of assay. There shall be no failure in respect of assay if the lot is to be accepted for this characteristic.

7 MARKING

7.1 Each package shall be marked with the following:

a) The purity of silver,
b) Net weight of one packet,
c) Batch or code number,
c) Weight of the tissue papers,
d) Actual weight of silver leaves,
e) The size of the silver leaf,
f) Trade-mark or name of the manufacturer, and
g) Any other information required under the *Legal Metrology (Packaged Commodities) Rules*, 2011 and the *Food Safety and Standards (Packaging and Labelling) Regulations*, 2011.

7.1.1 *BIS Certification Marking*

The product may also be marked with the Standard Mark.

7.2.1.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which a license for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Clause* 3)

DETERMINATION OF GRAMMAGE OF SILVER LEAF

A-1 PRINCIPLE

A-1.1 The grammage of silver leaf is calculated on the basis of the total weight of the known surface area of the leaf.

A-2 METHOD

A-2.1 Take such number of silver leaves so that its total area is more than 1 m^2.

A-2.2 Weigh these leaves in a chemical balance of least count of 0.01 mg.

A-2.3 Calculate the grammage of the silver leaf as:

$$\text{Grammage} = M/A$$

where

M = mass of the test piece in g; and
A = area, in m^2, of the test piece.

ANNEX B

[*Table* 1, *Sl No.* (i), (ii) *and* (iii)]

DETERMINATION OF CADMIUM, LEAD, AND ARSENIC IN SILVER FOIL BY ATOMIC ABSORPTION SPECTROPHOTOMETRIC METHOD

B-1 PRINCIPLE

B-1.1 The silver foil samples are dissolved and digested in nitric acid. The cadmium, lead and chromium in solution are determined by conventional flame atomic absorption spectroscopy.

B-2 APPARATUS

B-2.1 Conical Flask, 250 ml capacity

B-2.2 Graduated Volumetric Flask, 100 ml capacity

B-2.3 Atomic Absorption Spectrophotometer with an air-acetylene burner or nitrous oxide-acetylene burner. For determination of arsenic, a hydride generation vessel accessory to be made available. Instrument parameters are usually given by the manufacturer in the manual provided with the instrument.

B-2.4 Hollow cathode or electrode less discharge lamps for all elements.

B-2.5 Hot plate with heating control to heat up to 300°C.

NOTE — Carefully clean and rinse all glassware with HNO_3 to avoid metal contamination. First wash with water and detergent, rinse with tap water, followed by distilled water, then with dilute HNO_3 (1+9) and finally 3-4 times with distilled water.

B-3 REAGENT

B-3.1 Water — redistilled or deionized.

B-3.2 Nitric Acid Concentrated (A.R.) — sp gr 1.42.

B-3.3 Nitric Acid A.R. 5% — Dilute 5 ml concentrated nitric acid to100 ml with distilled water.

B-3.4 Hydrochloric Acid (A.R.) — sp gr 1.16-1.18.

B-3.5 Sodium Borohydride Pellets.

B-3.6 Perchloric Acid 60% (*m*/*m*) Solution

B-3.7 Cadmium Standard Solution — 1 000 mg/ l-$Cd(NO_3)_2$ in HNO_3.

B-3.8 Lead Standard Solution — 1 000 mg/l-$Pb(NO_3)_2$ in HNO_3.

B-3.9 Arsenic Standard Solution — 1 000 mg/l-As_2O_3 in HNO_3.

B-3.10 Working Standard Solution — Dilute standard solution with 1 percent HNO_3 that covers the Concentration of the elements to be determined.

B-4 PROCEDURE

B-4.1 Processing of Foil Sample

B-4.1.1 Weigh about 10 g of silver foil sample into a 250 ml conical flask and add 50 ml of nitric acid (1:3). Heat gently on a hot plate until the foil dissolves completely. In case of turbidity in the solution, add 2-3 drops of Perchloric acid and heat gently to obtain clear solution. Remove the flask from hot plate, cool and wash down sides of conical flask with 10 ml distilled water twice. Filter the contents of the flask into 100 ml volumetric flask and make up the volume with deionised water upto the mark.

Prepare a blank solution by following the same procedure as described for sample which is devoid of foil but using same quantities of reagents including water and subject it to identical treatment.

B-4.2 Instrumental Conditions

B-4.2.1 Select the wavelength and gases to be used for the particular element under consideration from Table 3.

Table 3

(*Clause* B-4.2.1)

Element	Wavelength mm	Gases
Cadmium	228.8	Air/Acetylene
Lead	283.3	Air/Acetylene
Arsenic	193.7	Nitrous oxide/Acetylene

B-4.2.2 The recommended settings for the various instrumental parameters vary from model to model and certain parameters require optimization at the time of use to obtain the best results. Instruments should therefore be adjusted as described in the manufacturer's instructions using the type of flame and wavelength settings specified above.

B-4.3 Determination of Cadmium, Lead and Arsenic

B-4.3.1 Set the atomic absorption spectrophotometer to the appropriate conditions as per the guidelines given in the Instruction Manual (provided along with the instrument).

B-4.3.2 Aspirate the strongest standard containing the element to be determined and optimize the instrument settings to give full-scale or maximum deflection on the chart recorder. Measure the absorbance against the concentration of the element in the standard solutions.

B-4.3.3 Aspirate the solution (A) obtained from the wet oxidation of the sample and the corresponding blank solution and determine the net absorbance.

B-4.3.4 Determine the concentration of element in the sample solution from the standard curve and incorporate it in the given formula to derive the content of element in sample (mg/kg).

$$\frac{\text{Concentration of element } (\mu\text{g/ml})}{\text{Weight of sample taken (g)}} \times 100 = \text{Element in sample (mg/kg)}$$

NOTE — Use hydride generator technique for Analysis of Arsenic.

ANNEX C

[*Table* 1, *Sl No.* (iv)]

HEAVY METALS

C-1 DETERMINATION OF HEAVY METALS

C-1.1 REAGENTS

C-1.1.1 *Ammonia Solution* — Dilute 400 ml of ammonium hydroxide (28 percent) to 1 000 ml with water.

C-1.1.2 *Lead Nitrate Stock Solution* — Dissolve 159.8 mg of lead nitrate in 100 ml of water containing 1 ml of nitric acid. Dilute with water to 1 000 ml and mix. Prepare and store the solution in lead-free glass containers.

C-1.1.3 *Standard Lead Solution*

Dilute 10 ml of lead nitrate stock solution, accurately measured, with water to 100 ml. Each ml of the solution so prepared contains the equivalent of 10 mcg of lead ion (Pb). Prepare the solution on the day of use.

C-1.1.4 *Nitric Acid* — concentrated.

C-1.1.5 Hydrogen Sulphide — A saturated solution of hydrogen sulphide made by passing hydrogen sulphide gas through cold water.

C-1.1.6 *Acetic Acid* — pure.

C-2 PROCEDURE

C-2.1 Solution A

Take the quantity of the standard lead solution of concentration equivalent to 40 ppm in 50 ml Nessler tube and add about 23 ml of water. Adjust the *p*H to between 3.0 to 4.0 by addition of acetic acid or ammonia solution. Dilute with water to 40 ml and mix.

C-2.2 Solution B

Weigh about 500 mg of foil sample into a 50 ml conical flask and add 5 ml of concentrated nitric acid. Heat gently on a hot plate until the foil dissolves completely. When clear solution is obtained, remove the flask from hot plate, cool and wash down sides of conical flask with 10 ml distilled water. Add drop wise ammonia solution until the solution is just alkaline to litmus paper, dilute with water to 25 ml and adjust the *p*H to between 3.0 and 4.0 by the addition of diluted acetic acid. Filter and wash the Sintered crucible and the filter with 10 ml of water (in two instalments). Transfer to a 50 ml Nessler tube. Dilute the combined filtrate and washed with double distilled water to make volume up to 40 ml.

C-2.3 To each tube, add 10 ml of freshly prepared hydrogen sulphide, wait for 5 minutes and view over a white surface. The colour of solution B shall not be darker than that of solution A.

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This Indian Standard has been developed from Doc No.: FAD 08 (2711).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi

AMENDMENT NO. 1 JULY 2015
TO
IS 3110 : 2015 SILVER LEAF — SPECIFICATION

(Second Revision)

[*Page* 1, *clause* **4.1**] — Insert the following at the end:

'No material of animal origin shall be used at any stage of manufacture silver leaf.'

(FAD 08)

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